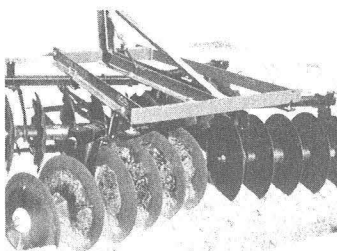
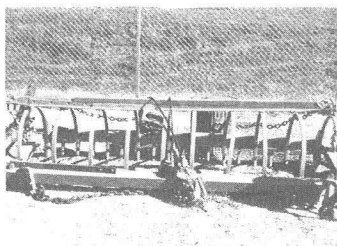




**US Army Corps
of Engineers**



**FISH & WILDLIFE
REFERENCE LIBRARY**

**ENVIRONMENTAL IMPACT
RESEARCH PROGRAM**

TECHNICAL REPORT EL-86-51

HYDROSEEDERS/MULCHERS

**Section 8.4.7, US ARMY CORPS OF ENGINEERS
WILDLIFE RESOURCES MANAGEMENT MANUAL**

by

Ted B. Doerr

Environmental Laboratory

DEPARTMENT OF THE ARMY

**Waterways Experiment Station, Corps of Engineers
PO Box 631, Vicksburg, Mississippi 39180-0631**



July 1986

Final Report

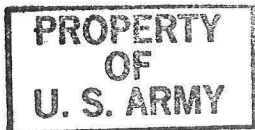
Approved For Public Release; Distribution Unlimited

Prepared for **DEPARTMENT OF THE ARMY**
US Army Corps of Engineers
Washington, DC 20314-1000
Under **EIRP Work Unit 31631**

Destroy this report when no longer needed. Do not return
it to the originator.

US - CE - C

The findings in this report are not to be construed as an official
Department of the Army position unless so designated
by other authorized documents.



The contents of this report are not to be used for
advertising, publication, or promotional purposes.
Citation of trade names does not constitute an
official endorsement or approval of the use of
such commercial products.

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE				Form Approved OMB No. 0704-0188 Exp. Date: Jun 30, 1986	
1a. REPORT SECURITY CLASSIFICATION Unclassified			1b. RESTRICTIVE MARKINGS		
2a. SECURITY CLASSIFICATION AUTHORITY			3. DISTRIBUTION/AVAILABILITY OF REPORT Approved for public release; distribution unlimited.		
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE			5. MONITORING ORGANIZATION REPORT NUMBER(S)		
4. PERFORMING ORGANIZATION REPORT NUMBER(S) Technical Report EL-86-51			7a. NAME OF MONITORING ORGANIZATION		
6a. NAME OF PERFORMING ORGANIZATION USAEWES Environmental Laboratory		6b. OFFICE SYMBOL (If applicable)	7b. ADDRESS (City, State, and ZIP Code)		
6c. ADDRESS (City, State, and ZIP Code) PO Box 631 Vicksburg MS 39180-0631			9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER		
8a. NAME OF FUNDING/SPONSORING ORGANIZATION US Army Corps of Engineers		8b. OFFICE SYMBOL (If applicable)	10. SOURCE OF FUNDING NUMBERS		
8c. ADDRESS (City, State, and ZIP Code) Washington, DC 20314-1000			PROGRAM ELEMENT NO.	PROJECT NO.	TASK NO.
					WORK UNIT ACCESSION NO. EIRP 31631
11. TITLE (Include Security Classification) Hydroseeders/Mulchers: Section 8.4.7, US Army Corps of Engineers Wildlife Resources Management Manual					
12. PERSONAL AUTHOR(S) Doerr, Ted B.					
13a. TYPE OF REPORT Final report		13b. TIME COVERED FROM _____ TO _____		14. DATE OF REPORT (Year, Month, Day) July 1986	
				15. PAGE COUNT 11	
16. SUPPLEMENTARY NOTATION Available from National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161.					
17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)		
FIELD	GROUP	SUB-GROUP	Hydroseeders Equipment Revegetation		
			Mulchers Applicators Planting methods		
			Hydromulchers Power mulchers		
19. ABSTRACT (Continue on reverse if necessary and identify by block number)					
<p>An equipment report on hydroseeders/mulchers is provided as Section 8.4.7 of the US Army Corps of Engineers Wildlife Resources Management Manual. The report is designed to assist the Corps District or project biologist with the selection and use of types of equipment and materials available for habitat development and manipulation. Topics covered include description, operation and maintenance, limitations, and availability.</p> <p>Hydroseeders are pieces of equipment designed to apply seed, mulch, herbicides, and soil tackifiers in one operation through a water-based slurry system. Management objectives for using hydroseeders/mulchers are stated, and benefits for wildlife habitat development are discussed. The design and assembly of equipment are described and illustrated, and general specifications are provided. Methods of operation are described, and maintenance and safety requirements are given. Appropriate cautions and limitations are discussed.</p>					
20. DISTRIBUTION/AVAILABILITY OF ABSTRACT <input checked="" type="checkbox"/> UNCLASSIFIED/UNLIMITED <input type="checkbox"/> SAME AS RPT. <input type="checkbox"/> DTIC USERS			21. ABSTRACT SECURITY CLASSIFICATION Unclassified		
22a. NAME OF RESPONSIBLE INDIVIDUAL			22b. TELEPHONE (Include Area Code)		22c. OFFICE SYMBOL

DD FORM 1473, 84 MAR

83 APR edition may be used until exhausted.
All other editions are obsolete.SECURITY CLASSIFICATION OF THIS PAGE
Unclassified

PREFACE

This work was sponsored by the Office, Chief of Engineers (OCE), US Army, as part of the Environmental Impact Research Program (EIRP), Work Unit 31631, entitled Management of Corps Lands for Wildlife Resource Improvement. The Technical Monitors for the study were Dr. John Bushman and Mr. Earl Eiker, OCE, and Mr. Dave Mathis, Water Resources Support Center.

This report was prepared by Mr. Ted B. Doerr, Range Science Department, Colorado State University, Fort Collins, Colo. Mr. Doerr was employed by the Environmental Laboratory (EL), US Army Engineer Waterways Experiment Station (WES), under an Intergovernmental Personnel Act contract with Colorado State University during the period this report was prepared. Mr. Chester O. Martin, Team Leader, Wildlife Resources Team, Wetlands and Terrestrial Habitat Group (WTHG), EL, was principal investigator for the work unit. Information and photographs were provided by personnel from Finn Corporation, Cincinnati, Ohio; James Lincoln Corporation, Garland, Tex.; and Reinco, Plainfield, N. J. Review and comments were provided by Mr. Martin, WES, and Mr. Larry E. Marcy, Texas A&M University.

The report was prepared under the general supervision of Dr. Hanley K. Smith, Chief, WTHG, EL; Dr. Conrad J. Kirby, Chief, Environmental Resources Division, EL; and Dr. John Harrison, Chief, EL. Dr. Roger T. Saucier, WES, was Program Manager, EIRP. The report was edited by Ms. Jessica S. Ruff of the WES Information Products Division (IPD). Drawings were prepared by Mr. John R. Harris, Scientific Illustrations Section, IPD, under the supervision of Mr. Aubrey W. Stephens, Jr.

COL Allen F. Grum, USA, was the previous Director of WES. COL Dwayne G. Lee, CE, is the present Commander and Director. Dr. Robert W. Whalin is Technical Director.

This report should be cited as follows:

Doerr, Ted B. 1986. "Hydroseeders/Mulchers: Section 8.4.7, US Army Corps of Engineers Wildlife Resources Management Manual," Technical Report EL-86-51, US Army Engineer Waterways Experiment Station, Vicksburg, Miss.

NOTE TO READER

This report is designated as Section 8.4.7 in Chapter 8 -- EQUIPMENT, Part 8.4 -- DRILL AND BROADCAST SEEDERS, of the US ARMY CORPS OF ENGINEERS WILDLIFE RESOURCES MANAGEMENT MANUAL. Each section of the manual is published as a separate Technical Report but is designed for use as a unit of the manual. For best retrieval, this report should be filed according to section number within Chapter 8.

HYDROSEEDERS/MULCHERS

Section 8.4.7, US ARMY CORPS OF ENGINEERS WILDLIFE RESOURCES MANAGEMENT MANUAL

DESCRIPTION	3	AVAILABILITY	7
OPERATION	5	LITERATURE CITED	8
LIMITATIONS	6		

Hydroseeders are designed to apply seed, mulch, herbicides, and soil tackifiers in one operation through a water-based slurry system; they can also be used for irrigation and to control dust and fire (Finn Corporation 1981). Hydroseeders can apply materials onto areas without having equipment directly on the site. This is advantageous on steep slopes and areas where compaction by equipment is detrimental. Hydroseeders have been used extensively for surface mine reclamation, revegetation of rights-of-way, dam face stabilization, and establishment of lawns. They can also be used to improve wildlife habitat on steep slopes using seed mixtures and mulches that will enhance growth of desirable forage species.

DESCRIPTION

Hydroseeders are simple pieces of equipment mounted on a truck or trailer (Fig. 1). They are composed of a large mixing tank that has agitating paddles or jets to mix the slurry and a motor-driven high-pressure centrifugal pump to move the material through a hose with a discharge nozzle. Tank sizes vary from 350 to 3000 gal. Large output centrifugal pumps can spray the mixture up to 200 ft. The hose (up to 200 ft in length) allows a larger area to be treated, or it can be used for small-scale or spot treatments. Spray type, rate of application, and distance of application are controlled by pump pressure and discharge volume, which can be adjusted by the person operating the nozzle. Several nozzle types are available to provide a variety of spray patterns (Reinco 1982). Other specifications are listed in Table 1.

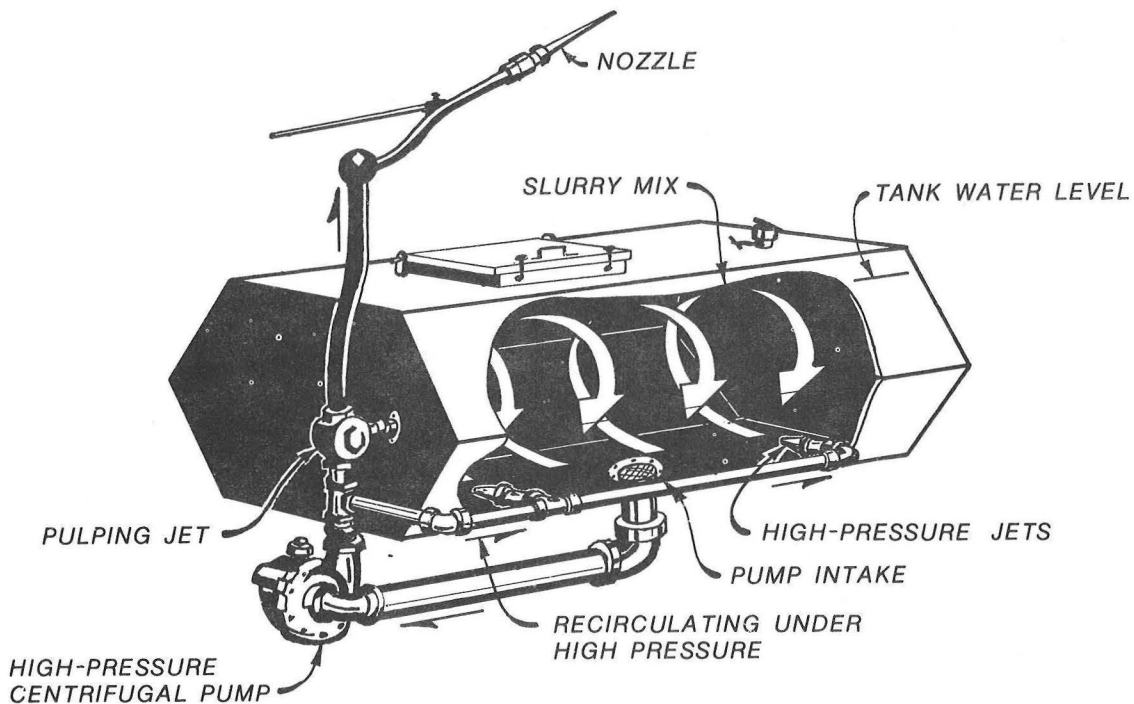
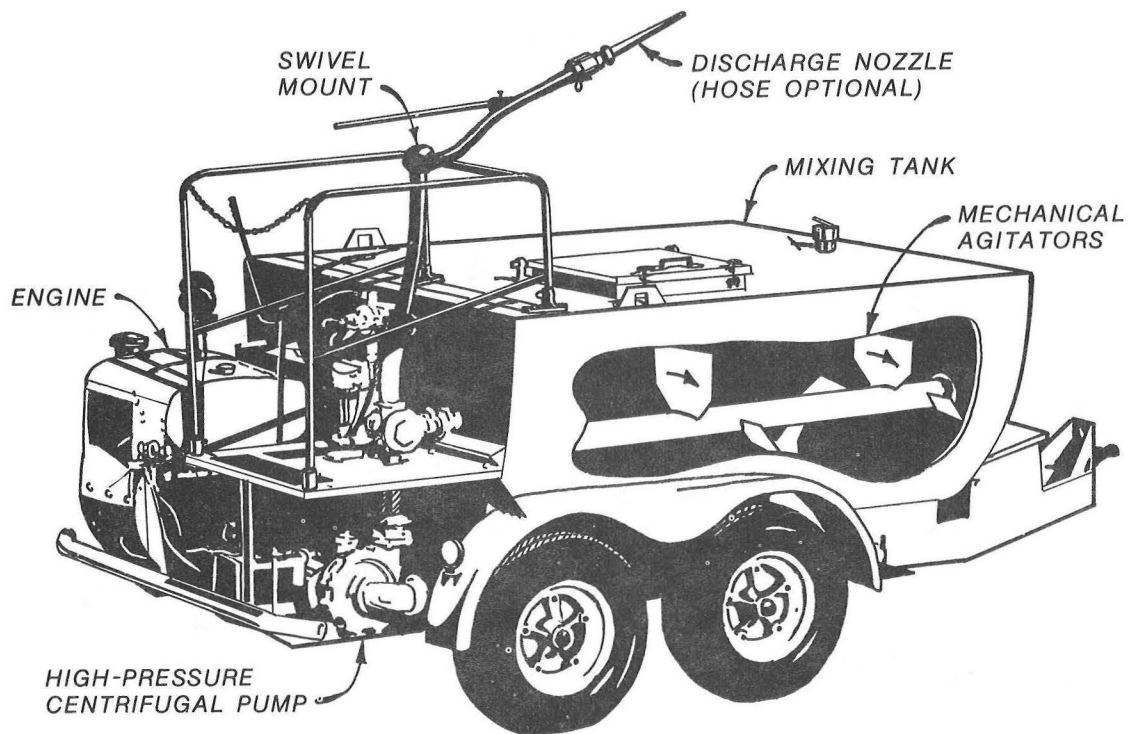


Figure 1. Trailer-mounted hydroseeder/mulcher with mechanical agitators (top). Bottom diagram shows a high-pressure jet agitation system which keeps the slurry mix in suspension (adapted from literature provided by the Finn and Reinco corporations)

Table 1. Specifications for 3 brands of hydroseeders

Feature	Finn	Bowie	Reinco
Type	Trailer and truck	Trailer and truck	Trailer and truck
Tank capacity	800-3000 gal	350-3000 gal	800-2500 gal
Agitator system	Paddle	Paddle	Hydraulic jet
Spray range	20-200 ft	20-200 ft	20-200 ft
Application rate	9-18 min/load		12-30 min/load
Options	200-400 ft hose	200 ft hose	200 ft hose
	6 nozzle types	5 nozzle types	3 nozzle types
	Irrigation sprinkler nozzle		

OPERATION

Hydroseeders can be operated while stationary or moving. Two to 3 people are required to operate the vehicle, feed the mixing tank, and operate the nozzle (Plass 1978, Larson 1980) (see Fig. 2). A supply truck is necessary to carry extra material for large jobs. Slurry-mix recommendations vary from 3% to 10% solids by weight (Larson 1980, Amimoto 1981). The slurry mix can contain various combinations of seed, fertilizer, organic mulch, pulverized limestone, inoculants, insecticides, and fungicides. It is best to follow manufacturers' guidelines and contract specifications.

The tank should be one-third full of water before solid materials are added (Amimoto 1981). The water and material should be agitated during the loading operation. Seed should not remain in the tank for longer than 1 hour to reduce seed damage and application problems (SCS 1976, Amimoto 1981). Seeding and mulching should be completed in 2 separate operations to improve plant establishment success. Recommended rates for mulch application vary from 900 to 4500 lb/acre depending on slope, soil texture, precipitation intensity, length of time required for slope protection, and other factors that determine erodibility of a site (Cook et al. 1970; Kay 1978, 1979; USDA Forest Service 1979; Amimoto 1981).

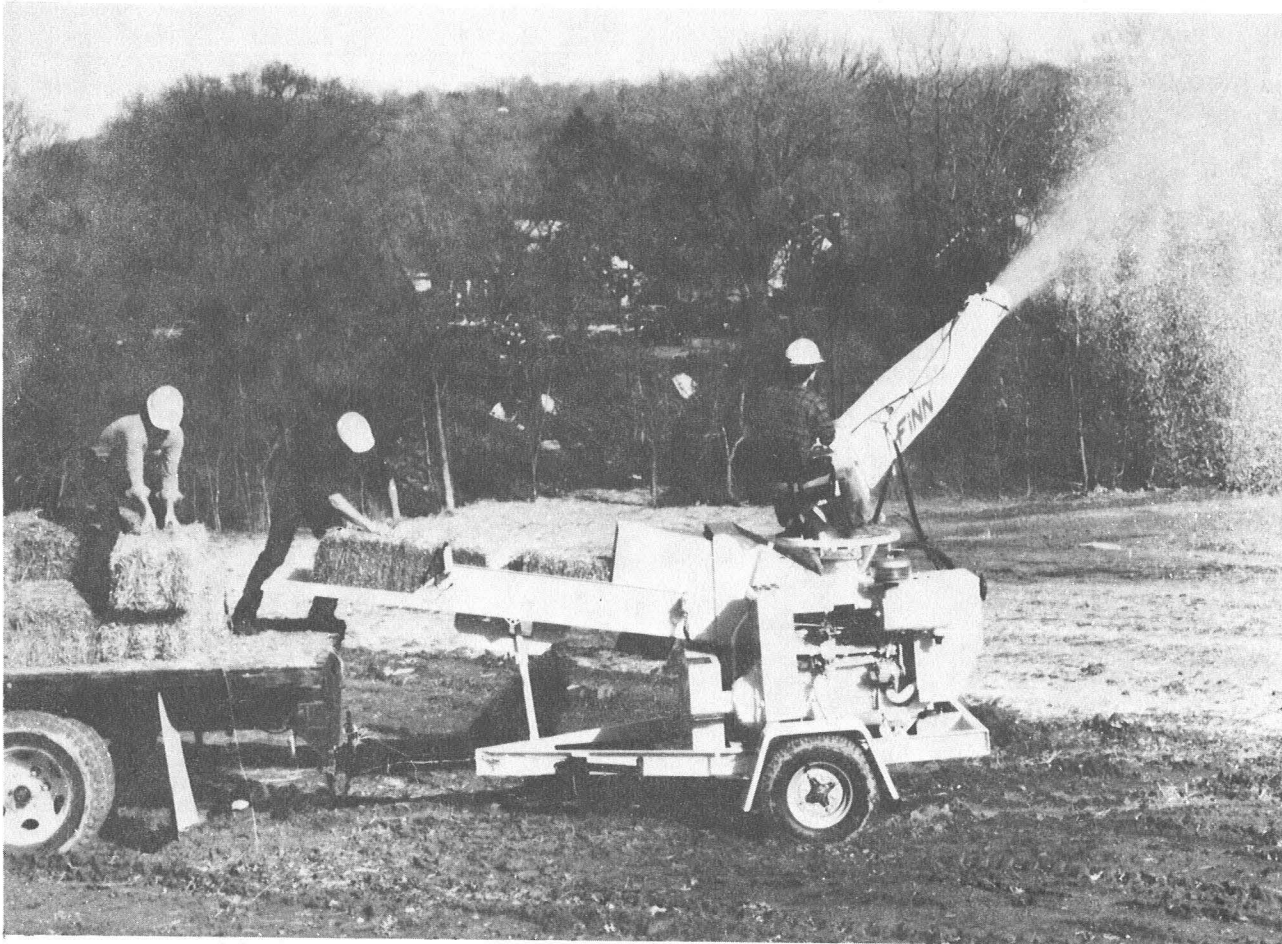


Figure 2. Medium power mulcher in operation (courtesy Finn Corporation)

LIMITATIONS

Hydroseeding is expensive and can only be justified when other application techniques are unavailable, overly manpower-intensive, not suited to a site, or require more time than schedules allow. This method also requires large amounts of water that may not be available at all sites. Hydroseeding is not adapted to normal operations in semiarid or arid regions (less than 14 in. rainfall) (Kay 1979) and is not suited for use on compacted soils. Hydraulic seeding and mulching equipment may damage seed and reduce germination by recirculating seed through the pump mechanism and internal agitators.

AVAILABILITY

Hydroseeders are available from the following sources:

Finn Corporation
2525 Duck Creek Road
Cincinnati, Ohio 45208

Reinco
P. O. Box 584
Plainfield, New Jersey 07061

James Lincoln Corporation
3220 S. Jupiter Road
Garland, Texas 75041

LITERATURE CITED

- Amimoto, P. Y. 1981. Erosion and sediment control handbook. Div. of Mines and Geology. Calif. Dep. of Conserv. 197 pp.
- Cook, C. W., I. B. Jensen, G. Coltharp, and E. M. Larson. 1970. Seeding methods for Utah roadsides. Utah Agric. Exp. Sta. Resour. Ser. 52. 23 pp.
- Finn Corporation. 1981. Equipment specification sheets T300, T250, T150, T80. Cincinnati, Ohio. 8 pp.
- Kay, B. L. 1978. Mulch and chemical stabilizers for land reclamation in dry regions. Pages 467-484 In F. W. Schaller and P. Sutton, eds. Reclamation of Drastically Disturbed Lands. 742 pp.
- _____. 1979. Hydromulching fibers - What's new. Univ. Calif. at Davis, Agronomy Prog. Rep. 98. 4 pp.
- Larson, J. E. 1980. Revegetation equipment catalogue. USDA For. Serv. Equipment Development Center, Catalogue No. 8042 2501. 198 pp.
- Plass, W. T. 1978. Use of mulches and soil stabilizers for land reclamation in the eastern United States. Pages 329-338 In F. W. Schaller and P. Sutton, eds. Reclamation of Drastically Disturbed Lands. 742 pp.
- Reinco. 1982. Equipment specification sheets HG-25M, HG-15M, HG-13M², HG-10M², HG-8, HG-8(A). Plainfield, N. J. 12 pp.
- SCS. 1976. Erosion and sediment control guidelines for developing areas in Texas. USDA Soil Conserv. Serv., Temple, Tex. 158 pp.
- USDA Forest Service. 1979. Mining and reclamation in the West: Vegetation. USDA For. Ser. Gen. Tech. Rep. INT-64. 85 pp.

BOOKS ARE ACCOUNTABLE PROPERTY CHARGED TO
AN INDIVIDUAL BY NAME. PLEASE DO NOT LEND
TO OTHERS WITHOUT CLEARING YOURSELF
(REF. ER 736-1-1)
WHEN OBSOLETE BOOKS ARE RETURNED TO THE
LIBRARY PLEASE INDICATE "OBSOLETE"

U.S. ARMY CORPS OF ENGINEERS, PORTLAND



00012614

TA 7 .W34 TR EL-86-51 c.2

Doerr, T. B.

Hydroseeders/mulchers

DISTRICT LIBRARY
U.S. ARMY ENGINEER DISTRICT, PORTLAND
P.O. BOX 2946
PORTLAND, OREGON 97208
FISH & WILDLIFE
REFERENCE LIBRARY

U. S. ARMY
ENGINEER DISTRICT. LIBRARY COPY
PORTLAND

14576853

TA
7
.W34
TR
EL-86-51
C. 2